Southwest Fisheries Science Center
PO Box 271
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March 2, 2001

FINAL CRUISE REPORT

VESSEL: NOAA Ship *DAVID STARR JORDAN*, Cruise Number DS-00-04;
Southwest Fisheries Science Center (SWFSC)
Marine Mammal Observation Cruise Number 1615

CRUISE DATES: 29 July - 9 December 2000

PROJECT: The *Stenella* Population Abundance Research (STAR00) project was a marine mammal assessment survey conducted in the Eastern Tropical Pacific Ocean (ETP). The survey was carried out with two vessels. The activities of the other vessel, NOAA Ship *McARTHUR*, are covered in a separate Report.

FOREIGN PARTICIPANT:
Instituto National de la Pesca, México (INP)

ITINERARY: The cruise consisted of six legs with three- to four-day scheduled port calls between each leg. Equipment malfunctions delayed departure for Leg V by two days. Research was conducted in the international waters of the ETP and in the coastal waters of Mexico, Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, Panama, and France (Clipperton Island).

29 JUL	Depart San Diego, CA
29 JUL - 16 AUG	Leg I
16 AUG - 19 AUG	Mazanillo, Mexico
19 AUG - 08 SEP	Leg II
08 SEP - 12 SEP	Acapulco, Mexico
12 SEP - 01 OCT	Leg III
01 OCT - 05 OCT	Puntarenas, Costa Rica
05 OCT - 23 OCT	Leg IV
23 OCT – 29 OCT	Puerto Quetzal, Guatemala
29 OCT – 16 NOV	Leg V
16 NOV - 20 NOV	Manzanillo, Mexico
20 NOV - 09 DEC	Leg VI
09 DEC	Arrive San Diego, CA

OBJECTIVES:

The project was a multidisciplinary survey with the primary objective being to estimate the abundance of dolphins affected by the ETP purse-seine fishery for yellow-fin tuna, *Thunnus albacares*. The survey's design targeted the depleted stocks of spinner dolphins, *Stenella longirostris orientalis* (the eastern stock), and spotted dolphins, *Stenella attenuata* (the northeastern offshore stock). Additional data and samples were collected in order to characterize the physical and biological characteristics of the ecosystem. This year's survey was the third and final year of a three-year (1998-2000) study.

STUDY AREA:

The study area extended from the US/Mexico border, south to the territorial waters of Peru, bounded on the east by the continental shores of the Americas, and to the west by Hawaii (roughly from 30° N to 18° S, from the coastline to 153° W, see Fig. 1). Past studies indicate this region encompasses the entire distribution of the dolphin stocks most affected by the fishery. This area is approximately the same as that covered by the 5-year Monitoring of Porpoise Stocks (MOPS) survey conducted by SWFSC between 1986 and 1990. The study area was divided into three sampling strata which received different levels of survey effort: the core area, the coastal area, and the outer area (Fig.1).

PROCEDURES:

Cetaceans were surveyed using line transect methods. Observers maintained a visual watch during daylight hours (approximately 0600 to 1800) using two 25 X 150 power "bigeye" binoculars mounted on the port and starboard sides of the ship's flying bridge. Two additional 25 X 150 binoculars were mounted on the flying bridge: one for periodic use during sightings and the other for bird observations. Binocular height above the water was 10.7 meters, giving a maximum ship-to-horizon sighting distance of approximately 11.7 km (6.3 nm).

Six mammal observers rotated through three watch positions: port binocular, data recorder, and starboard binocular. Observers shifted positions every 40 minutes. At least one identification specialist with previous experience in the ETP was on watch at all times. The observer at the port binocular surveyed the area between 10° right and 90° left of the trackline. The observer at the starboard binocular surveyed the area between 10° left and 90° right of the trackline. Thus, the area 10° to either side of the trackline was covered by both observers while more lateral regions were covered by one observer or the other. Using unaided eye and 7X binocular, the data recorder searched the entire 180° forward of the ship, with effort focused on the trackline and the area from the ship out to about 400 meters (the "blind" area in the 25X).

The data recorder entered sighting, weather and effort information into a laptop computer on the flying bridge using the software program "WinCruz", developed at SWFSC. The computer was linked to the ship's global positioning system (GPS) to record time and position.

For each marine mammal sighting, bearing (using an azimuth ring on the binocular mount to measure angle) and distance (using a reticle scale inscribed in the eyepiece) were recorded, along with the initial sighting cue. Schools were approached if they were within three nautical miles perpendicular to the trackline. Observers identified cetaceans to species/stock when possible, and made independent estimates of school size. If more than one taxon was present, percent composition for each was estimated, also independently by each observer.

Seabird observations were conducted concurrently with mammal observations using strip transect methods. A single bird observer recorded identity and behavior for all seabirds within 300 m of one fore-quarter of the ship. Mammal observers on the bigeyes detected feeding flocks within 3.7 km (2 nm) on either side of the ship, and the bird observer recorded size and species composition using either the fourth bigeye binocular or handheld 20X binocular.

Taxonomic identification and position of sea turtles were recorded when they were sighted. Turtles close to the ship's trackline were captured using a small boat. Captured turtles were measured, weighed, and flipper-tagged. Blood or skin samples for genetic and hormonal studies, lavage stomach contents, and feces were collected. Satellite transmitters were attached to some turtles to determine their movements and dive patterns. All turtles were subsequently released unharmed.

Helicopter operations were conducted in order to obtain photographs of dolphin schools for calibrating observer estimates of school size, for analysis of cetacean lengths, and for studies of pinniped and seabird colonies. Flights were made in the morning and afternoon during optimal weather conditions: clear skies and sea state below Beaufort 4. All mammal observers on the vessel made estimates of school size and taxonomic composition for these calibration schools.

Cetacean tissue samples for genetic analysis were obtained on an opportunistic basis using hollow-tipped darts fired from a crossbow. Samples were collected from the bow of the ship or from a small boat.

Photographs of cetaceans were taken from the ship and from a small boat in order to verify stock identity and to document geographic variation. Individually identifiable whales were photographed for population studies.

Acoustic recordings of cetaceans were obtained by deploying sonobuoys near the animals. Sonobouys received in the frequency range of 10 Hz – 2.5 kHz (Type 53 sonobuoy) or 10 Hz to 20 kHz (Type 57 sonobuoy).

The behavioral responses of 11 stocks of 8 species of dolphins and 14 species of whales were observed relative to the survey vessels. Data collection emphasized dolphin schools and focused on behaviors that would indicate reactions to the vessel. The data included information on (1) group behavior, (2) school size and shape, (3) reactions to the research vessel and (4) an estimate by the observers of whether the overall reaction of the school to the research vessel was evasive, non-evasive, both, or unknown.

Dipnet sampling for flyingfish and other surface organisms was conducted for one hour at night (approximately 2000-2100 local time) concurrently with the evening conductivity-temperature-depth (CTD) station. Additional sampling was conducted for an hour before sunrise on Legs 4, 5, and 6 during the morning CTD. Small fish were captured and kept alive for aquarium research and display.

Micronekton biomass between 0 and 500 m depth was sampled using active acoustics with a Simrad EQ50 echo sounder and two hull-mounted transducers. The echo sounder was operated at 38 and 200 kHz, and interfaced to a data acquisition system. The EQ50 was operated continuously, except on alternate days in the core area east of 120W and north of 5N, when the transducer was turned off in order to test whether transmission affected dolphin behavior and sighting rates.

Oceanographic data were collected throughout the survey. Two CTD stations were scheduled every 24 hours: an hour before sunrise and an hour after sunset. A SeaBird CTD with General Oceanics rosette was used for these stations. From each cast, chlorophyll samples (to 200 meters) and salinity samples (500 and 1000 meters or bottom) were collected and processed on board. Nutrient samples (0 - 500 meters) were collected, frozen, and stored for later analysis. Primary productivity was measured by 14C-uptake. Three expendable bathythermographs (XBT) were dropped daily while underway at 0900, 1200, and 1500 hours local time. Water samples for chlorophyll a analysis and bucket temperatures were also collected daily at 0900, 1200, 1500, and 1800 hours.

In the evening, two or three net sampling stations were conducted: a surface manta tow for fifteen minutes following the post-sunset CTD station, a bongo net tow for 45 minutes to 200 meters, and/or a ring net tow during legs II through IV to 200 meters following the completion of the manta tow.

RESULTS:

Observers visually surveyed 13,793 kilometers of trackline (Fig. 1). A total of 817 sightings of marine mammals were recorded, 692 of which were on-effort. The following tables summarize the data collected.

TABLE 1: Marine Mammals
TABLE 2: Seabirds
TABLE 3: Sea Turtle Sightings
TABLE 4: Sea Turtle Samples
TABLE 5: Dipnet Samples
TABLE 6: Biopsy Samples
TABLE 7: Photogrammetry Effort
TABLE 8: 35 mm Hand-held Photographic Effort
TABLE 9: Sonobuoy Recordings
TABLE 10: Marine Mammal Behavior
TABLE 11: Oceanography

SCIENTIFIC PERSONNEL:

Chief Scientist: Dr. Lisa T. Ballance, NOAA, NMFS, SWFSC

Name	Position	Affliation
Leg 1:		
Robert Pitman	Cruise Leader	SWFSC
Michael Force	Birder	SWFSC
Sophie Webb	Birder	SWFSC
Roy Dehart	Helicopter Mechanic	AOC
Julie Helmers	Helicopter Pilot	AOC
Doug Kinzey	ID Specialist	SWFSC
Paula Olson	ID Specialist	SWFSC
Erin LaBrecque	Mammal Observer	SWFSC
Juan Carlos Salinas	Mammal Observer	SWFSC
Suzanne Yin	Mammal Observer	SWFSC
Kerry Kopitsky	Oceanographer	SWFSC
Valerie Philbrick	Oceanographer	SWFSC
John Brandon	Photogrammetrist	SWFSC
Morgan Lynn	Photogrammetrist	SWFSC
Rueben Valenzula	Visiting Scientist	INP
Leg 2:		
Robert Pitman	Cruise Leader	SWFSC
Michael Force	Birder	SWFSC
Sophie Webb	Birder	SWFSC
Roy Dehart	Helicopter Mechanic	AOC
Julie Helmers	Helicopter Pilot	AOC
Doug Kinzey	ID Specialist	SWFSC
Paula Olson	ID Specialist	SWFSC
Erin LaBrecque	Mammal Observer	SWFSC
Laura Morse	Mammal Observer	SWFSC
Juan Carlos Salinas	Mammal Observer	SWFSC
Suzanne Yin	Mammal Observer	SWFSC
Amy Hays	Oceanographer	SWFSC
Kerry Kopitsky	Oceanographer	SWFSC
John Brandon	Photogrammetrist	SWFSC
Morgan Lynn	Photogrammetrist	SWFSC
Leg 3:		
Lisa Ballance	Cruise Leader	SWFSC
Michael Force	Birder	SWFSC
Robert Pitman	Birder	SWFSC
Ron Helgeson	Helicopter Mechanic	AOC
Dave Gardner	Helicopter Pilot	AOC
Doug Kinzey	ID Specialist	SWFSC
Paula Olson	ID Specialist	SWFSC
Erin LaBrecque	Mammal Observer	SWFSC

Scientific Personnel (Continued)

Name	Position	Affliation
Laura Morse	Mammal Observer	SWFSC
Juan Carlos Salinas	Mammal Observer	SWFSC
Suzanne Yin	Mammal Observer	SWFSC
Ron Dotson	Oceanographer	SWFSC
Kerry Kopitsky	Oceanographer	SWFSC
Jim Gilpatrick	Photogrammetrist	SWFSC
Charlie Stinchcomb	Photogrammetrist	SWFSC
Leg 4:		
Lisa Ballance	Cruise Leader	SWFSC
Michael Force	Birder	SWFSC
Robert Pitman	Birder	SWFSC
Ron Helgeson	Helicopter Mechanic	AOC
Dave Gardner	Helicopter Pilot	AOC
James Cotton	ID Specialist	SWFSC
Richard Rowlett	ID Specialist	SWFSC
Isabel Beasley	Mammal Observer	SWFSC
Anne Douglas	Mammal Observer	SWFSC
Kathy Hough	Mammal Observer	SWFSC
Ernesto Vázquez	Mammal Observer	SWFSC
Ron Dotson	Oceanographer	SWFSC
Kerry Kopitsky	Oceanographer	SWFSC
Morgan Lynn	Photogrammetrist	SWFSC
Charlie Stinchcomb	Photogrammetrist	SWFSC
Nathan Lovejoy	Visiting Scientist	UC Berkeley
Leg 5:		
Lisa Ballance	Cruise Leader	SWFSC
Brett Jarrett	Birder	SWFSC
Robert Pitman	Birder	SWFSC
Ron Helgeson	Helicopter Mechanic	AOC
Debora Barr	Helicopter Pilot	AOC
James Cotton	ID Specialist	SWFSC
Richard Rowlett	ID Specialist	SWFSC
Isabel Beasley	Mammal Observer	SWFSC
Anne Douglas	Mammal Observer	SWFSC
Kathy Hough	Mammal Observer	SWFSC
Ernesto Vázquez	Mammal Observer	SWFSC
Dave Griffith	Oceanographer	SWFSC
Kerry Kopitsky	Oceanographer	SWFSC
Katie Cramer	Photogrammetrist	SWFSC
Jim Gilpatrick	Photogrammetrist	SWFSC
Leg 6:		
Robert Pitman	Cruise Leader	SWFSC
Brett Jarrett	Birder	SWFSC
Roy Dehart	Helicopter Mechanic	AOC
Julie Helmers	Helicopter Pilot	AOC

Scientific Personnel (Continued)

Name	Position	Affliation
James Cotton	ID Specialist	SWFSC
Richard Rowlett	ID Specialist	SWFSC
Isabel Beasley	Mammal Observer	SWFSC
Anne Douglas	Mammal Observer	SWFSC
Kathy Hough	Mammal Observer	SWFSC
Ernesto Vázquez	Mammal Observer	SWFSC
Dave Griffith	Oceanographer	SWFSC
Kerry Kopitsky	Oceanographer	SWFSC
Katie Cramer	Photogrammetrist	SWFSC
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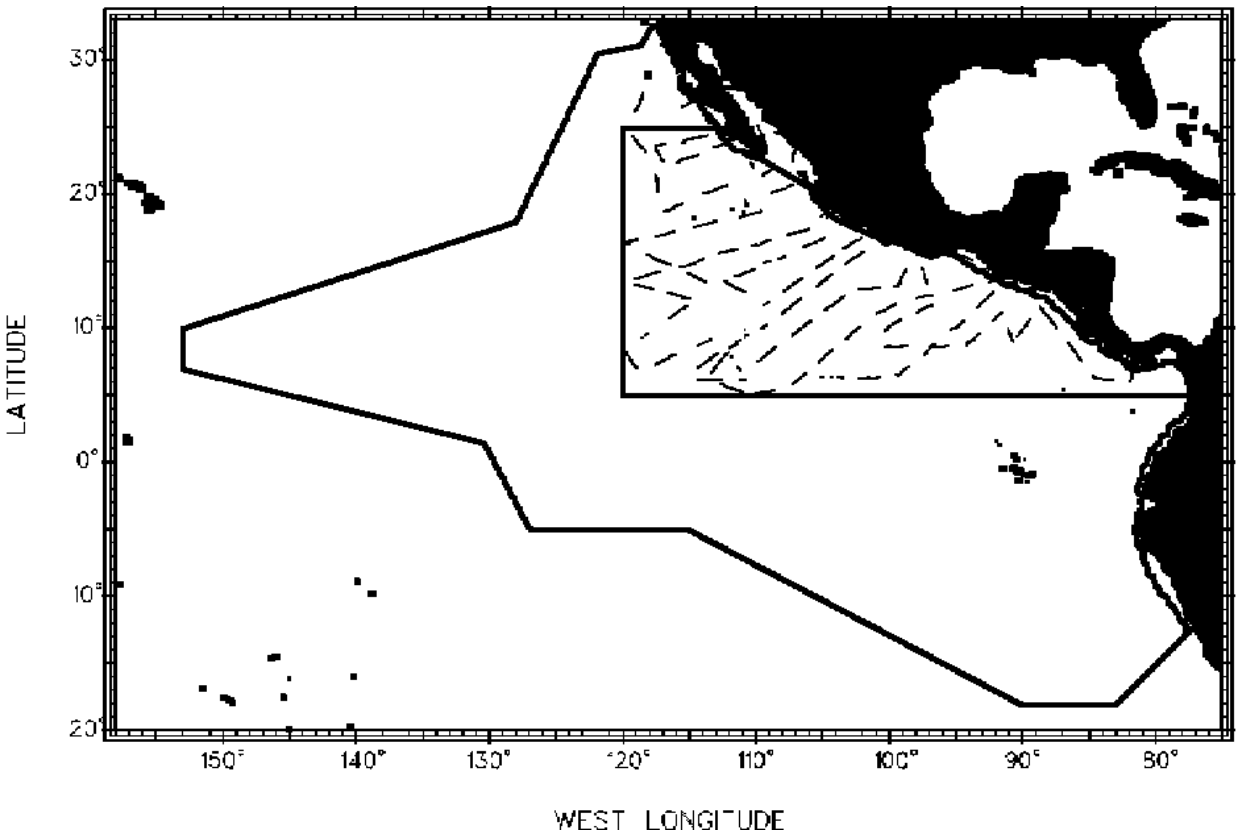

Figure 1 – *David Starr Jordan* tracklines (broken lines) and sampling strata boundaries (solid lines) for the STAR00 survey. The smaller box delineates the core sampling stratum and the surrounding polygon defines the outer sampling stratum. A third, coastal stratum follows the 1,000 m contour. The black portions of the tracklines represent the time spent actively searching for marine mammals.

Table 1 – Identity and number of marine mammal schools sighted during the STAR00 survey from the *David Starr Jordan,* listed in decreasing order of the number of schools seen. A total of 817 schools were sighted, of which 45 contained more than one taxa and are recorded more than once in this table.

Sighting Category	**Leg 1**	**Leg 2**	**Leg3**	**Leg 4**	**Leg 5**	**Leg 6**	**Total**
unid. dolphin	23	25	38	26	16	15	143
Stenella attenuata (offshore)	11	33	24	12	12	15	107
Tursiops truncatus	25	7	34	21	10	8	105
Stenella coeruleoalba	10	19	4	21	14	13	81
Stenella longirostris orientalis	11	15	15	8	9	6	64
Delphinus delphis	23			10	8	7	48
Stenella attenuata (unid. subsp.)	13	10	8	7	1		39
Stenella attenuata graffmani			13	18	2		33
ziphiid whale	3	3	10	5	5	4	30
Steno bredanensis	2	8		4	10	1	25
Kogia sima	6	10	4	3	1		24
Grampus griseus	6	3	3	2	1	6	21
Balaenoptera sp.	5		3	3	2	6	19
Balaenoptera musculus	5			9	4		18
Ziphius cavirostris	5	1	1	5	6		18
Balaenoptera edeni	5		1	4	4	3	17
unid. small whale	2		4	2	2	1	11
Globicephala macrorhynchus	1		4	2	3		10
Megaptera novaeangliae	2			7		1	10
Orcinus orca	2		1	2	1	4	10
unid. sea lion	9						9
Mesoplodon sp.	1	1	1	5			8
Arctocephalus townsendi	6						6
Balaenoptera borealis/edeni	3	2	1				6
Lagenorhynchus obliquidens	6						6
unid. cetacean	1	2	2	1			6
Mesoplodon sp. A		2	1	1	1		5
Stenella longirostris (unid. subsp.)	1		2			2	5
Pseudorca crassidens				1	3		4
Delphinus sp.	2		1				3
Stenella longirostris (whitebelly)		1			1	1	3
unid. large whale	2				1		3
unid. pinniped	3						3
Delphinus capensis	2						2
Mirounga angustirostris	2						2
Physeter macrocephalus		1			1		2
Stenella longirostris (southwestern)			1			1	2
Zalophus californianus	2						2
Balaenoptera acutorostrata						1	1
Berardius bairdii	1						1
Feresa attenuata		1					1
Kogia sp.	1						1
Mesoplodon densirostris					1		1
Mesoplodon peruvianus		1					1
unid. fur seal	1						1
Total	203	145	176	179	119	95	917

Table 2 - Number of seabirds sighted aboard the *David Starr Jordan* during STAR00, listed in taxonomic order.

Common name	**Scientific name**	**Leg 1**	**Leg 2**	**Leg 3**	**Leg 4**	**Leg 5**	**Leg 6**	**Total**
Albatrosses	Diomedeidae	14	0	0	0	0	0	14
Procellariidae								
Shearwaters	*Puffinus* spp.	3079	1754	1765	545	551	525	8219
Petrels	*Pterodroma* spp., *Procellaria* spp., *Bulweria* spp., *Pseudobulweria* spp.	5	3798	3982	58	624	105	8572
Storm-petrels	Oceanitidae	3833	174	363	208	501	513	5592
Tropicbirds	Phaethontidae	7	22	8	15	21	21	94
Pelicans	Pelecanidae	91	0	0	16	0	0	107
Boobies	Sulidae	1211	813	484	682	843	436	4469
Cormorants	Phalacrocoracidae	5	0	0	0	0	0	5
Frigatebirds	Fregatidae	551	10	91	40	3	10	705
Phalaropes	Phalaropodidae	828	225	137	149	314	32	1685
Jaegers	Stercorariidae	20	42	52	130	74	67	385
Gulls	*Larus* spp.	265	1	6	92	28	52	444
Terns	*Sterna* spp., *Gygis* sp., *Chlidonias* spp.	336	1226	608	1396	643	1057	5266
Noddies	*Anous* spp.	41	0	0	4	19	0	64
Auks	Alcidae	33	0	0	0	0	0	33
Total		10,319	8065	7496	3335	3621	2818	35,654

Table 3 – Number of sea turtles sighted from the *David Starr Jordan* during STAR00.

Species/Taxon	Leg 1	Leg 2	Leg 3	Leg 4	Leg 5	Leg 6	Total
Caretta caretta	12			1	1	3	17
Chelonia mydas	3						3
Dermochelys coriacea			1				1
Lepidochelys olivacea	37	67	113	83	21	3	324
unidentified hardshell	72	62	52	133	75	10	404
Total	124	129	166	217	97	16	749

Table 4 – Sea turtles sampled for blood, skin, stomach contents, or feces, and flipper- or satellite-tagged from the *David Starr Jordan* during STAR00.

Species	Sample Type	Leg 1	Leg 2	Leg 3	Leg 4	Leg 5	Leg 6	Total
Caretta caretta								
	Blood	7					3	10
	Biopsy	2						2
	Flipper tag	18					6	24
	Satellite tag	3					2	5
	Lavage						2	2
Chelonia mydas								
	Blood	3					1	4
	Biopsy	2						2
	Flipper tag	11						11
	Satellite tag	1					1	2
Lepidochelys olivacea								
	Blood	24	42	40	27	17	3	153
	Biopsy	4						4
	Flipper tag	54	80	125	98	32	6	395
	Satellite tag		1					1
	Lavage	1	4	9	3	3	2	22
	Feces			1				1

Table 5 – Dipnet stations and total number of fish collected per leg aboard the *David Starr Jordan* during STAR00.

	Leg 1	Leg 2	Leg 3	Leg 4	Leg 5	Leg 6	Total
no. stations	17	20	18	34	35	35	159
no. fish	410	514	593	1057	711	591	3876

Table 6 – Number and identity of skin biopsy samples obtained aboard the *David Starr Jordan* during STAR00, listed in taxonomic order.

Species/Stock	**Leg 1**	**Leg 2**	**Leg 3**	**Leg 4**	**Leg 5**	**Leg 6**	**Total**
Megaptera novaeangliae				2		1	3
Balaenoptera acutorostrata						2	2
Balaenoptera edeni	2			1			3
Balaenoptera musculus	10			4	3		17
Berardius bairdii	2						2
Steno bredanensis	2	2		1	6		11
Tursiops truncatus	24	7	23	19	14	19	106
Stenella attenuata	26	13	15	31	10	12	107
Stenella attenuata graffmani			25	41	4		70
Stenella attenuata (unid. stock).	28	18	8	10	1		65
Stenella longirostris orientalis	36	2	6	22	13		79
Stenella coeruleoalba	1	1		3	1	2	8
Delphinus delphis	4			1	3	7	15
Delphinus capensis	3						3
Lagenorhyncus obliquidens	4						4
Feresa attenuata		6					6
Pseudorca crassidens				3	15		18
Orcinus orca	3		2	6	1	6	18
Globicephala macrorhynchus	13		11	13			37
Rhincodon typus (whale shark)				1			1
Total	158	49	90	157	71	49	574

Table 7 – Helicopter photogrammetry effort, and identity and number of cetacean schools photographed, aboard the *David Starr Jordan* during STAR00. Cetaceans are listed in taxonomic order.

	Leg 1	**Leg 2**	**Leg 3**	**Leg 4**	**Leg 5**	**Leg 6**	**Total**
Effort							
Days Flown	14	4	4	8	9	13	52
% Days Flown	78%	20%	21%	44%	47%	68%	46%
Flight Hours	38.1	14.3	8.9	24.0	24.4	33.2	142.9
Mean Flight Hrs./Days Flown	2.72	3.58	2.23	3.00	3.70	3.92	2.75
Number of schools Photographed	32	18	14	22	14	17	117
Number of Schools for Calibration	8	3	5	9	2	5	32
% Photographed Schools Calibrated	25%	17%	36%	41%	14%	29%	27%
Species/Taxa Photographed							
Stenella attenuata	7	4	2	6	1	4	24
Stenella longirostris	2	0	0	0	0	0	2
Mixed *S. attenuatta* and *S. longirostris*	1	3	3	1	1	1	10
Stenella coeruleoalba	2	6	5	7	1	0	21
Delphinus sp.	3	0	0	1	3	4	11
Other Small Cetaceans	8	4	2	5	4	6	29
Unid Small Cetaceans	1	0	1	0	0	0	2
Lg. Whales	8	0	0	2	2	*1*	13
Beaked Whales	1	1	1	0	2	1	5
Total Schools Photographed	24	17	13	20	10	15	99

Table 8 – Cetacean schools photographed by hand-held 35 mm camera from the *David Starr Jordan* during STAR00, listed in taxonomic order.

Species/Taxa	Leg 1	Leg 2	Leg 3	Leg 4	Leg 5	Leg 6	Total
Megaptera novaeangliae	1			2		1	4
Balaenoptera edeni				1	1		2
Balaenoptera musculus	5			3	3		11
Ziphius cavirostris	2						2
Mesoplodon peruvianus		1					1
Steno bredanensis		1			1		2
Tursiops truncatus		1	2	1		1	5
*Stenella attenuata (*offshore)	2	1	5				8
Stenella attenuata graffmani			5	2			7
Stenella attenuata (unid. subsp.)	2	4	2				8
Stenella longirostris (hybrid)						1	1
Stenella longirostris orientalis	3	4	3	3	2		15
Stenella coeruleoalba				4	1	1	6
Delphinus delphis	2						2
Delphinus capensis	1						1
Delphinus sp.			1				1
Lagenorhynchus obliquidens	1						1
Grampus griseus				1			1
Pseudorca crassidens					1		1
Orcinus orca	2		1	2	1	2	8
Globicephala macrorhynchus	1			1			2
Total	22	12	19	20	10	6	89

Table 9 – Number of cetacean recordings per leg for which acoustic recordings were obtained using sonobouys on the *Jordan* during STAR00, listed in decreasing order of recordings obtained. A total of 17 sonobouys were launched, of which 10 were functional. One of 2 "Type 57" and 9 of 15 "Type 53" sonobuoys operated correctly following deployment.

Species	Recordings
Balaenoptera musculus[1]	6
Balaenoptera edeni	1
Total	7

[1] Animals were not heard on every recording

Table 10 - Behavioral observations of cetacean schools recorded from the *David Starr Jordan* during STAR00, listed in decreasing order of number of schools for which observations were recorded.

Species	**Leg 1**	**Leg 2**	**Leg 3**	**Leg 4**	**Leg 5**	**Leg 6**	**Total**
Stenella attenuata (offshore)	11	31	23	12	11	14	102
Tursiops truncatus	21	5	33	21	9	8	97
Stenella coeruleoalba	10	18	3	20	14	13	78
unid. dolphin	8	3	16	19	11	15	72
Stenella longirostris orientalis	11	13	15	8	8	6	61
Delphinus delphis	23			9	8	7	47
Stenella attenuata (unid. subsp.)	12	10	8	6	1		37
Stenella attenuata graffmani			13	17	1		31
Steno bredanensis	2	8		4	10	1	25
Grampus griseus	6	2	3	2	1	6	20
Balaenoptera musculus				8	4		12
ziphiid whale				5	4	2	11
Ziphius cavirostris	1			5	5		11
Orcinus orca	2		1	2	1	4	10
Globicephala macrorhynchus	1		2	2	4		9
Kogia sima	2	1	2	3	1		9
Megaptera novaeangliae				7		1	8
Balaenoptera edeni				3	3	1	7
Stenella longirostris (unid. subsp.)	1		2	1		2	6
Balaenoptera sp.				1		5	6
Lagenorhynchus obliquidens	5						5
Pseudorca crassidens				1	3		4
Delphinus sp.	2		1				3
Mesoplodon sp.				3			3
Stenella longirostris (whitebelly)		1			1	1	3
Mesoplodon sp. A		1		1	1		3
Delphinus capensis	2						2
unid. small whale					1	1	2
Stenella longirostris (southwestern)			1			1	2
Physeter macrocephalus					1		1
Feresa attenuata		1					1
unid. large whale					1		1
Mesoplodon densirostris					1		1
Balaenoptera acutorostrata						1	1
Total	120	94	123	160	105	89	691

Table 11 - Summary of oceanographic data collected from the *David Starr Jordan* during STAR00.

Type of Sample	**Leg 1**	**Leg 2**	**Leg 3**	**Leg 4**	**Leg 5**	**Leg 6**	**Total**
CTD casts	30	39	37	35	34	33	208
CTD chlorophyll samples	300	380	350	328	326	330	2014
Surface chlorophyll samples	73	74	70	66	61	64	408
Primary productivity samples	105	133	119	126	116	112	711
Nutrient samples	331	429	383	358	359	363	2223
Salinity samples	96	118	90	91	98	108	601
XBT drops	52	61	55	55	51	55	329
Manta Tows	15	20	14	16	18	7	90
Bongo Tows	4	13	8	16	18	7	66
Ring net tows	0	11	8	6	4	0	29